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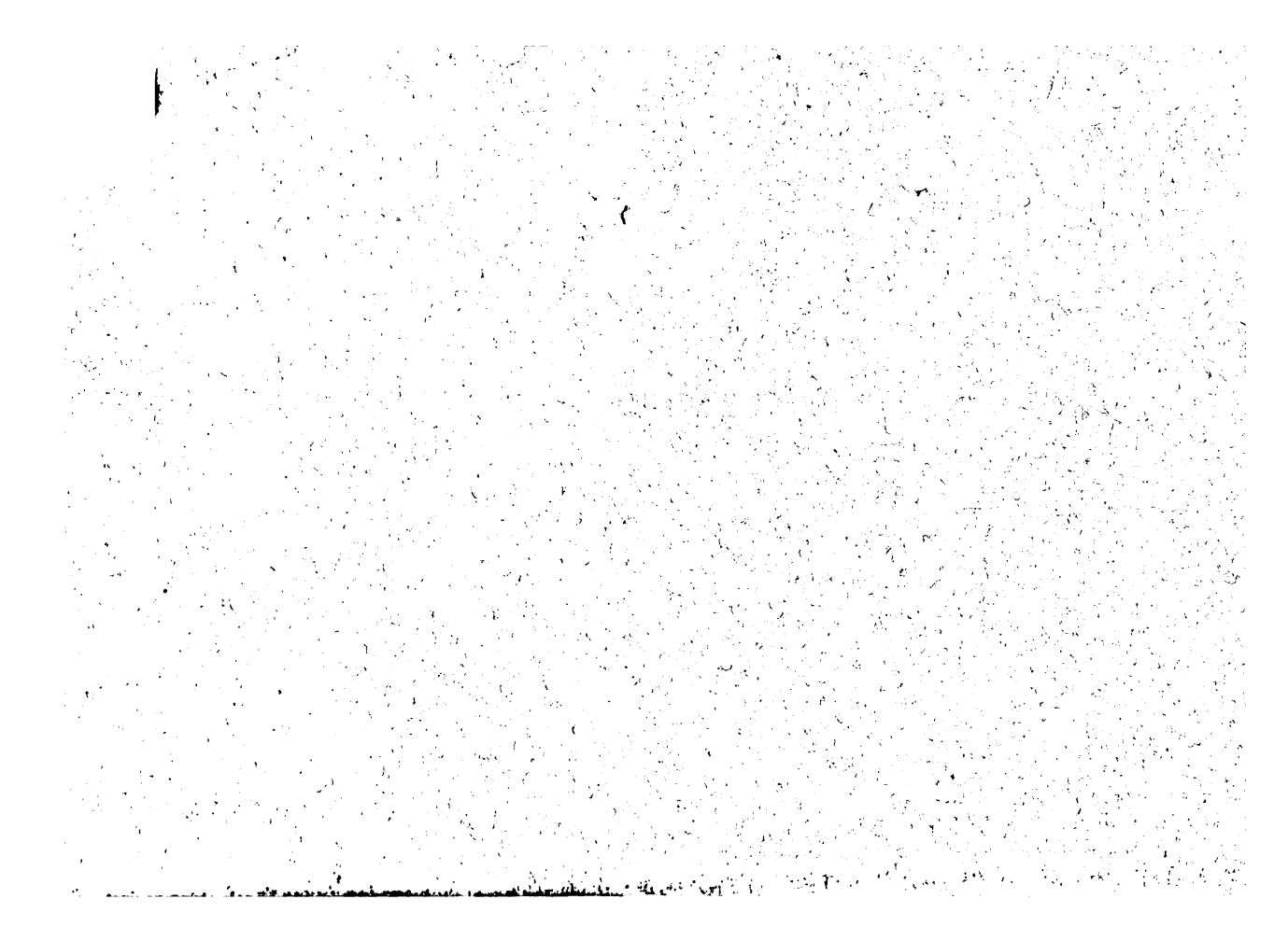

Rec'd pph. from Geo. Angell

"If you must kill them, do it without cruelty. Every animal has a right to justice and protection at the hands of the superior animal — man."

VIVISECTION:

FIVE HUNDRED DOLLAR PRIZE ESSAYS,

COPYRIGHTED AND PUBLISHED BY

THE AMERICAN HUMANE EDUCATION SOCIETY,

JULY, 1891,

And sold at two dollars per 100, or at same rate for less number.

FOR COPIES WRITE

GEO. T. ANGELL,

President *[of the American Humane Education Society, the Massachusetts Society for the Prevention of Cruelty to Animals, and the Parent American Band of Mercy],* ***19 Milk Street, Boston.***

I should be glad to send these Essays, without charge, to *every physician* and *every editor* in America, if our "*American Humane Education Society*" had the funds to do it. Will friends who think they ought to be so circulated send us the means?

GEO. T. ANGELL,
19 Milk Street, Boston.

THE WHOLE IN A NUTSHELL.

What is your object, Mr Angell?

Answer. My object in founding "*The American Humane Education Society*" is to humanely educate the American people for the purpose of stopping *every form of cruelty, both* to human beings and the lower animals.

How do you propose to do it?

Answer. 1st. By sending humane information, and the gems of humane literature, pictures, songs, and stories, through the press and otherwise, as I have been sending *hundreds of thousands of copies of* "*Our Dumb Animals*" and "*Black Beauty*," all over this country.

2d. By the employment of missionaries, forming "*Humane Societies*" and *hundreds of thousands* of "*Bands of Mercy*" in schools, Sunday schools, and elsewhere, similar to the *over ten thousand* we have already formed.

3d. By showing the millions of American youth, in ways too numerous to be mentioned in this statement, *that every kind word they speak or kind act they do makes their own lives happier, and better prepares them for what may come after.*

4th. By building up in our colleges, schools, and elsewhere, in ways I shall be glad to explain to those interested, a *spirit of chivalry and humanity*, which shall in coming generations *protect the defenceless* and *maintain the right.*

GEO. T. ANGELL.

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VIVISECTION PRIZE ESSAYS

PUBLISHED BY

THE AMERICAN HUMANE EDUCATION SOCIETY.

INTRODUCTION.

Some time since one of the most intelligent of our Massachusetts judges stopped me on the street and said, "Mr. Angell, what is the meaning of the word *Vivisection?*" I found he knew nothing of the subject and had not the slightest conception of the meaning of the word. And yet in that word is involved to *the dumb races* one of the most important questions of the nineteenth century.

For the obtaining of light on this important subject, I offered last year, in behalf of our "*American Humane Education Society*," two prizes of $250 each for the two best essays, one advocating the affirmative and the other the negative of the following question, namely,—*In the interests of humanity, should vivisection be permitted, and if so, under what restrictions and limitations?*

In offering these prizes, I recognized the fact that good men and women may widely differ—that the human mind is so constituted that all cannot think alike, and that there is probably no better way, short of the special interposition of Divine Providence, of changing human beliefs than by *full and fair discussion by those most able to fully and fairly discuss.*

The experiences of European and American anti-vivisection societies the past twenty years, during which vivisections have enormously increased, and are now enormously increasing, seem to me to render attempts to stop or limit them useless, unless in some way our American people, *including the best and most humane of the medical profession*, can be satisfied that it ought to be done.

Whether animals after death pass into a happier existence, I do not know.

re-classed

How far their sufferings here are compensated hereafter, I do not know.

If the Almighty Power that gives us this life has power to give us another, and in that other to punish for wrongs and compensate for suffering here, then I see no reason why the same rule may not apply to these faithful dumb servants, friends, and companions who toil and die in our service.

I am glad to believe that animals do not pass at death into anything worse than they endure here.

To bring before the public from the ablest thinkers the best light that can be obtained on vivisection, I offered, as before stated, these two prizes. The time was limited to expire January 1, 1891—the length not to exceed eight thousand words,—each essay to be signed with a fictitious name, and contain in accompanying sealed envelope the real name and post-office address of the writer, which was not to be known until the committees had made their awards.

Under this offer *nineteen* essays were received advocating vivisection, and *fourteen* opposing.

Most of them were written with much care and ability.

Probably no better committees could have been obtained in America than *Drs. Bowditch, Whitney, and Mixter*, [the dean and two professors] of the "*Harvard University Medical School*," who considered the essays *favoring* vivisection, and *Philip G. Peabody, Esq.*, who on behalf of the "*American Anti-vivisection Society*" took charge of those *opposing* vivisection.

I think that no reader of the successful essays will doubt that probably no abler presentations of both sides of the question have ever been made.

We publish them in pamphlet form and *copyright* them, and hereby give *every one* the right to publish them *together*, and *forbid their publication separately.*

The order of their publication was decided by lot drawn in the presence of our President and Secretary by Vice-president Hon. Henry B. Hill, which places the essay opposing vivisection first in the pamphlet.

I publish them in pamphlet form because the very large number of children who read "*Our Dumb Animals*" forbids our filling its columns with discussions which properly belong to medical and anti-vivisection papers.

"*Our Dumb Animals*" must be cheery and happy, or it would soon lose thousands of its present readers and a large part of its present influence.

It must go like the sunlight into our American homes to brighten and beautify, and win, we trust, millions to join our armies of mercy now being organized all over this country, which will, we hope, sooner or later, *through the mighty power of humane education*, drive every vestige of unnecessary cruelty from American soil.

In behalf of our "*American Humane Education Society*" I respectfully ask all humane persons to read and carefully consider these two essays.

GEO. T. ANGELL,

President [*of the American Humane Education Society, the Massachusetts Society for the Prevention of Cruelty to Animals, and the Parent American Band of Mercy*], ***19 Milk Street, Boston.***

THE AMERICAN HUMANE EDUCATION SOCIETY.

The first Society of its kind in the world.

The American Humane Education Society, the first of its kind in the world, was incorporated as a National Society by Act of the Legislature of Massachusetts, March, 1889, with power to hold half a million of dollars free from taxation.

It received during its *first* year in its permanent fund real estate given by its president, valued at over three thousand dollars, and for present and future use money given by persons in various States to the amount of over eight thousand dollars more.

Its object is to carry humane education into all our American schools and homes, and to found "Humane Societies" and "Bands of Mercy" over the whole American Continent.

In its *first* year it founded in Western States *fourteen new "Humane Societies"* and *four hundred and sixty-six new "Bands of Mercy;"* offered prizes to the students in all our American colleges, also to all American editors, for best essays on the *Effect of Humane Education on the Prevention of Crime;* employed an active missionary, and sent nearly a hundred thousand copies of humane publications into every State and Territory except Alaska.

In its second year it has vastly increased the above work, and also has printed and printing about *four hundred thousand copies of "Black Beauty."* Many thousands of these it has given away, and the rest it has sold largely *at the bare cost, or less than cost.*

Its directors are among our most respected citizens.

All persons wishing information as to what it has already done and is proposing to do will receive prompt answers by writing

GEO. T. ANGELL,

President [*of the American Humane Education Society, the Massachusetts Society for the Prevention of Cruelty to Animals, and the Parent American Band of Mercy*], ***19 Milk Street, Boston.***

MARCH 1, 1891.

CIRCULATION OF "OUR DUMB ANIMALS."

Our *smallest* monthly issue last year was *thirty-six thousand;* our *largest*, *seventy-five thousand.*

This included the sending of it *monthly* to the editors of about *fourteen thousand* American newspapers and magazines.

To *many thousands* of kind notices given us by the editors of these papers and magazines, we are indebted for the immense circulation of "*Black Beauty*," of which we have printed and printing in *fifteen months* from its publication *four hundred and sixty-five thousand* copies — probably more than double the number ever printed of any book in the world within the same length of time from publication.

IN THE INTERESTS OF HUMANITY, SHOULD VIVISECTION BE PERMITTED, AND IF SO, UNDER WHAT RESTRICTIONS AND LIMITATIONS?

BY JOSEPH M. GREENE, 3 ELMONT STREET, DORCHESTER, MASS.

The subject of vivisection, except within the past few years, has attracted little attention from the public in general, although the custom itself is very ancient. Of late years the subject has been much agitated in the interests of reform; and yet the average person is doubtless ignorant of the facts relating thereto.

The importance of this subject cannot be denied. Whatever is fraught on the one hand with comfort or misery to many sentient beings; and on the other hand may contain the secret of great power for knowledge, or a will-o'-wisp of fallacy luring humanity to error and evil, cannot fail to concern all.

Vivisection is the dissection of or otherwise experimenting on living animals in the interests of Science. It is not alone the cutting of the flesh; — it comprises also experiments with drugs, inoculation with disease, and other tests having a supposed value physiologically or with reference to disease.

In the consideration of any practice with regard to its regulation by law, four important points must be weighed: 1. What is its object? 2. To what extent is that object effected? 3. Do the results justify the cost? 4. Is or is not the means employed inherently wrong?

1. The nominal objects of vivisection are three: (*a*) The discovery of physiological and pathological facts. (*b*) The demonstration of known facts. (*c*) The acquirement of dexterity in surgery. These objects, it must be confessed, are creditable. There are, however, other motives, generally concealed, and frequently disclaimed, which enter into this question, and these will be considered hereafter. The present question is this: —

2. To what extent does vivisection effect its purpose? First, in discovery or original research, we shall attempt to prove the unscientific nature of this method. *a*. Logically, or from the nature of things. *b*. Practically, or from the actual results.

a. Logically, we believe vivisection to be unscientific, for two reasons: —

1. The difference in species.
2. The abnormal condition of the subject.

1. What is true of one species of lower animal in respect to functional phenomena is not necessarily true of another, on account of the differences in structure, habit, disposition, etc. How much greater, then, the gulf between the lower animals and man! If different individuals of the *same* species exhibit such widely variant symptoms as occur in these experiments, how can one species be a guide for another? Certain human diseases cannot be communicated to the lower animals; and many drugs, deadly to man, are harmless to them. A pigeon has taken with impunity opium enough to kill a man; antimony is harmless to horses; mice can take hemlock with safety, and dogs, mercury; some animals are not injured by the deadly belladonna. In the case of injection of drugs into the blood, the results are widely different in different animals of very similar structure.

Nature thus seems to indicate conclusively that the difference of species offers an insurmountable obstacle to this method of experiment. In the words of M. Longet: "Experiments on animals of different species, so far from tending to useful results, have a tendency to mislead us."

2. If not under the influence of anæsthetics, which are themselves injurious, and are therefore, as we shall see, generally omitted, the vivisected animal is in the abnormal condition of acute physical pain. Now, physical pain has a great influence on the vital functions, and must necessarily have a vitiating effect upon the experiment. Moreover, all forms of mental distress — rage, terror, etc. — greatly affect the physical system, and these in vivisection are stimulated to the utmost. It is well known that mental feeling can cause death even in animals; and that worrying an animal will make its flesh more or less unfit for food.

In addition to pain, other causes affect the experiment: the strained and immovable condition of the subject, and exhaustion affecting the blood, respiration, and nerves.

The vital organs are exposed to the air, isolated from their natural surroundings, and roughly handled. Irritation of an organ will be transmitted to the nerve centres, thence to be reflected in disastrous effects upon that organ.

Prof. Béclard, in describing an experiment, says: "The animal is so prostrated that it is impossible to draw any positive conclusions" ("Treatise on Physiology," p. 1013.) And yet the condition required for physiological experiment is that "the animals should be healthy and in good condition." This abnormal condition was well illustrated in one of the experiments of Magendie, who concluded that the use of the pancreatic gland was unknown because that organ did not secrete its product when exposed in experiment. The distinguished Dr. Carpenter, himself a vivisectionist, has acknowledged that "the attempt to insulate any one organ necessarily destroys or considerably alters those very conditions under which alone its functions can be normally performed."

When, in addition to mutilation by the knife, drugs are administered for the purpose of ascertaining their real nature, then vivisection is seen in its entirety. If even healthy human saliva, when injected into the tissue of an animal, has caused death, as noted by Dr. Sternberg, what definite results should we expect from the poisoning of animals under abnormal conditions? We must protest that the importance of the "*environment*," so much dwelt upon by our scientific friends, is here somewhat slighted.

Nature, when put to the torture, will answer incoherently and at random, as did criminals in the olden time.

We have seen from a logical point of view that the method of vivisection is unscientific; and in this conclusion we are confirmed by the testimony of some of the greatest medical authorities.

Sir Charles Bell, the noted English physiologist, in his work, "Nervous System of the Human Body," p. 217, says: "The opening of animals has done more to perpetuate error than to confirm the just views taken from the study of anatomy."

Henry J. Bigelow, Professor of Surgery at Harvard College in 1871, in an address before the Massachusetts Medical Society, said: "How few facts of immediate considerable value to our race have been extorted from the cold-blooded cruelties now and more and more practised under the authority of science!"

Sir Lawson Tait, Fellow of the Royal College of Surgeons, in his work, "Uselessness of Vivisection," declares, "Experiments on animals did and could teach nothing; for operations have been performed on thousands of animals every year for centuries, and nothing whatever has been learned from this wholesale vivisection."

We are confirmed also by the acknowledgments of many distinguished vivisectors.

Prof. David Ferrier, of Edinburgh, has admitted: "*Nor do* the facts of experimental physiology seem so consistent with themselves or with the undoubted facts of chemical research as to inspire us with unhesitating confidence in their accuracy." And yet the same authority has said with reference to this subject: "The *slightest doubt* is *absolute failure*."

Prof. Colin, of Paris, confesses that "experiments repeated twenty times give twenty different results. Unfortunately this happens too often."

Dr. Elliotson admits that "the same effects do not occur with different species of animals."

Dr. Gamgee, before the English Royal Commission (on the subject of vivisection) in 1875, testified that "physiological experiments are more liable to fallacies than any other." And yet this is said to be "an exact science!"

Prof. Hughes Bennett says that "in making experiments on animals it is often impossible to tell how far the shock of the operation may vitiate the results."

Dr. William Rutherford, of Edinburgh, acknowledged before the Royal Commission above mentioned that "pathological experiments *must afterwards be tried on a man*, before a conclusion could be drawn."

b. Let us now consider the value of vivisection from the standpoint of its practical result in certain definite fields of investigation. After its many years of existence, this method, if scientific, should prove its worth in no uncertain way; and yet the record of the practical results of vivisection shows: —

1. Its uselessness.
2. Its injurious effects.
3. Its false claims.

1. In the course of evidence given before the English Royal Commission of 1875, Mr. John Simon, under whose direction certain vivisectionists in the employ of government had been experimenting on animals with a view to improving the health of the people, testified as to the results obtained in various diseases. With regard to cholera it was confessed that *all* he had to offer as a result of the extended experiments was the fact that *cholera discharges were infective*, — a fact already known to everybody.

Regarding consumption the total result obtained was the fact of *the contagion* of the disease. Now, this fact had been demonstrated long before in the case of human beings by a certain Dr. Weber.

In the case of sheep-pox Mr. Simon acknowledged that 'none of his experiments would enable a veterinary surgeon to treat this disease more successfully than before.'

Dr. Wm. Rutherford, of Edinburgh, a number of years ago, made many painful experiments upon dogs in order to ascertain the effect of calomel on the bile secretion. The results were contradictory, both among themselves and to the conclusions of Prof. Schiff; and not one quarter part conclusive information was deduced, as had been already obtained by clinical observation years before.

Numerous experiments have been performed on the gastric functions, but the results have been ever dubious and varying, on account of the great disturbance to the system caused thereby. All that was ever elucidated in this way had been known before from observation of the human subject.

Sir Lawson Tait, in his "Uselessness of Vivisection," p. 27, says: "No further success was achieved in abdominal surgery from 1701 to 1809, practitioners being *led astray* by vivisection."

The Royal Medical and Surgical Society of London, a number of years ago, instituted painful experiments on animals, by suffocation, drowning, etc., to determine best means of resuscitation and other desirable facts in the case of human beings. The result was confessed by the Society to be "of no practical benefit to the human race."

Prof. Virchow was entirely successful in inoculating rabbits with *trichinosis*; but when the disease afterwards appeared as an epidemic he was powerless to control it.

The great Magendie had a theory that the muscles of the stomach were not used in vomiting. The barbarous experiment to prove this theory has been repeated hundreds of times, and yet the theory is not established.

Even Dr. Brown-Séquard's elixir, procured at the cost of incalculable suffering, has disappeared from human interest.

Viewed collectively, the results of vivisection are the same. Dr. Albert Leffingwell, in *Lippincott's Magazine*, August, 1884, gives a table showing from conclusive authority that "the very diseases for the mitigation of which scientists have vivisected for the past half-century, have been during that time steadily on the increase!"

Dr. Leffingwell also says (*Scribner's Monthly*, July, 1880, p. 34): "During the last quarter of a century vivisection has not resulted in the discovery of a single remedy of acknowledged and accepted value." In the light of this, how fitting seems the confession of the French vivisectionist, Claude Bernard,—"Without doubt, our *hands are empty* to-day!"

The failure of purely physiological experiments to be of any practical value to suffering humanity is readily understood when we consider that physiological facts, pure and simple, are *entirely irrelevant* for medical purpose. The treatment of disease cannot be judged from the inspection of healthy functions, as Dr. A. de Noe Walker declared before the Royal Commission: "The knowledge of the healthy functions of animal life does not contain in itself any therapeutic agents for the treatment of any disease by which those parts may be affected."

2. The injurious effects of vivisection may be seen not only in instances of positive damage to the system of patients, but also in errors and contradictions on matters closely relating to health.

With regard to Lister's far-famed carbolic ligature, concerning which vivisectionists have made so many boasts, Sir Lawson Tait, in a letter to the "*Birmingham Daily Mail*," July 21, 1882, says: "If the carbolic ligature had never been tried on animals, where it seems to answer admirably, it would never have been tried on human patients, where it failed miserably, and has cost many lives."

Influenced by his experiments on dogs, Sir Astley Cooper at one time supposed that when the bone of the human thigh was broken *inside of the capsule*, repair by *bony union* was impossible, but could occur only *by ligament*. Of course, in the case of the dog, the restless nature of the animal would prevent the bony union. As a result this distinguished surgeon, both himself directly and by example

indirectly, "inflicted permanent and unnecessary lameness on many people."

Some years ago a Commission was sent by the English Minister of Agriculture to oversee the inoculation experiments being made in Hungary. In the medical periodical "*The Practitioner*," the Commission reported that they 'could not overlook the fact that, after the protective inoculations, the deaths from certain other diseases (catarrh, pneumonia, etc.) occurred *exclusively among the inoculated animals*.'

The great physiologists, Bernard and Pavy, have made numerous vivisectional experiments on the *sugar-forming* functions of the liver. The results were as follows: Bernard thought that sugar was formed by a *healthy* liver; Pavy, that it was formed by an *unhealthy* liver!

Erroneous views as to the uses of the different sets of nerves have arisen from the fact that irritation of the *motor* nerves in vivisection will cause *pain*, induced by sympathetic affection.

In 1882 Prof. Koch (see "*Medical Times*," Aug. 26th of that year) considered it "impossible to prevent tuberculosis by inoculation." Now he claims to have found the secret; and yet, in his own words, "there is great danger of a new growth, the use of the lymph is dangerous, and deaths have resulted from it." The conditions necessary for treatment are extraordinary, and the patient must be constantly watched. Such treatment seems on the face of it to be opposed to nature.

3. The false claims of vivisectionists as to well known and useful discoveries are numerous. The written testimony of Harvey himself, the discoverer of the circulation of the blood, is that he was first led to the discovery by anatomical observation. Dr. J. H. Bridge, in "*Fortnightly Review*," July 1, 1876, says: "The more Harvey's immortal work is studied the more palpable is the fallacy that its discovery resulted from any such process of direct inspection as vivisection is supposed to give. No such *verification* by the process of direct inspection *has ever been made*, or by the nature of things *can* be."

Years before Harvey lived the circulation of the blood through the lungs was known from anatomical dissection, and the general circulation had been hinted at by several physiologists. From observation of the valves in the arteries, and from facts well known, Harvey drew his conclusion.

Sir Charles Bell's discovery of the functions of the anterior and posterior nerves has been claimed for vivisection; but he himself has often disclaimed that idea, and declared the discovery as due to anatomical study.

Vaccination is another bold claim, and yet Jenner, in his own written testimony describing the discovery, declares that it was made without a single experiment on a living

animal, but simply from observing that immunity from disease followed certain conditions. The absurd claim has been made that anæsthetics are the result of vivisection. It is well known that the discoveries of chloroform and ether were made respectively by Sir James Y. Simpson and an American dentist through experiments on *themselves*. Hunter's method for cure of *aneurism* was first carried out on a human subject. Subsequent experiments on animals gave rise to the claims of vivisectionists.

The discovery of the glycogenic function of the liver had been made from natural observation years before an experiment on animals had been made for that purpose; and the beneficial results from the improvements in ovariotomy by Dr. Wells are admitted by him to have been due to improved *methods of nursing* in after treatment.

"Pasteurism," or the method of breeding the virus of rabies in animals for diluted application to the human being, is a practice which has furnished an excellent stepping-stone to a man's ambition. Hydrophobia was a very rare disease till Louis Pasteur caused a panic on that subject. The many who have died from the effects of inoculation are not counted, while those who recover, whether or no as a result of the "treatment," are considered as trophies of victory!

Diseases of various kinds are often mistaken for hydrophobia; and it has never been proved conclusively that there is a particle of virtue in Pasteur's method.

The above facts tend to show that vivisectionists have a habit of appropriating what has been discovered by other methods.

They consider a fact "suspected" when learned from pathological observation, but "verified" when shown by them.

The only consistent and practical method of investigation, as experience has shown, is plainly that of pathological observation,—a careful scrutiny of human diseases and their results,—combined with anatomical study and post-mortem examinations, assisted by chemistry and the microscope. "Disease is an experiment by nature," and is all around us. "Circumstances alter cases," and experiment should be conducted in that field where it is intended to be of use.

The study of anatomy alone would have saved countless vivisections. Well has it been said, "It is not the motion of machinery that explains the mechanism, but the mechanism that explains the motion." Lawrence the physiologist has said: "The extensive examination of various *structures* has thrown great light on the *functions* of the human frame."

Sir Astley Cooper's success, according to his biographer (who was a vivisectionist), "had its source in dissection of the dead."

Chemistry is a great and certain force in the medical world, and, instead of ineffectively using the systems of

animals, experiments with poisons should be made chemically, through processes of reaction and neutralization.

The living system is not necessary for experiments on nervous energy. Galvanic action can be applied with perfect success to the body recently dead.

The famous Abernethy stood at the head of his profession as regards knowledge of the digestive functions, and yet he denounced the practices of vivisection.

Long before experiments were made on the brains of animals, various effects of the mutilation or absence of this organ on the vital and mental functions, and life itself, had been discovered by pathological observation, and vivisection but served to confuse what was already learned.

Both logically and practically, then, we conclude that the method of vivisection is one of the greatest errors of this century. Its record of one hundred years is one of uncertainty, a long list of failures and insignificant success. The experiments, contradictory and varying in result, are repeated till "verification" becomes refutation. The protests of vivisectionists that they alone can tell what is a "beneficial result" seems to be in the nature of a confession.

When, however, beneficial results are *proved* to be wanting, they plead the "advancement of science," pure and simple (as does Dr. Herman, of Zurich: "*Die vivisections-frage*"); and when it is shown that by this practice science has not been advanced, but on the contrary retarded, they tell us, as did Dr. Sharply before the Royal Commission of 1875, that "it is a very difficult thing to tell what a *discovery really is*"! Some one has appropriately said that "this is the only professed science that lives on excuses."

The other nominal objects of vivisection, — *b*. the demonstration of known facts, and, *c*. the acquirement of dexterity in surgery, — demand but little notice. If by this method employed for original research, complicated points, as we have seen, are not elucidated; as a method of demonstration for such points it must fail. On the other hand, the simpler physiological facts do not for their comprehension require this laborious method. Dr. John Fletcher, of Edinburgh Medical School, in a lecture said, "None of the functions of animals need to be seen in action in order to be perfectly understood." With the improved models and advantages for anatomical dissection of the present day, vivisection is here clearly superfluous.

As to the acquirement of surgical dexterity, the same reasons as proved vivisection useless for original research, apply largely here. The conditions vary utterly between the human being and the animal; and the practice would tend to distract the attention of the student from his future field of labor. Anatomical operations and assisting in actual practice would render such preliminary experiment entirely useless. Nearly the whole body of the surgical

profession themselves indignantly disclaim the necessity for any such method of test; and Professor Owen has said, "The arguments for learning to experiment by repeating experiments on living animals are as futile as those for so learning to *operate chirurgically*."

3. Having so far considered the purposes and results of vivisection, we now come to the question of the cost. From what we have seen it is evident that the cost should be very slight if it is to be justified by the results. The only phases of the cost of vivisection necessary now to consider are: *a*. The suffering caused the lower animals. *b*. The moral effect upon mankind.

Before, however, we examine the main question of suffering, one important point directly relating thereto demands the attention, — the subject of anæsthetics; and we shall attempt to show, largely from the testimony of the experimenters themselves, that the effectiveness of anæsthetics as applied to vivisection is, on the whole, a *sham* and *delusion*.

The subject is naturally divided into: 1. Real anæsthetics. 2. False anæsthetics. 3. The uncertainty of all anæsthetics.

The use of real anæsthetics (chloroform, ether, morphine) in many cases is impracticable and dangerous to life. Chloroform has a very injurious effect, especially upon the nerve centres and vital organs, vitiating the result of almost any experiment. It is a fact well known to the profession that only a comparatively small number of experiments will allow of its use, and these only as a preliminary measure. Dr. Hoggan, in his "Anæsthetics," page 1, says regarding chloroform: "Nothing can be more uncertain than its influence upon the lower animals. Complete and conscientious anæsthesia is seldom even attempted." And again: "Anæsthetics have proved the greatest curse of vivisectible animals."

Dr. de Noe Walker testified before the Royal Commission that if it is supposed that while an animal lived and was experimented on, it was thoroughly insensible, "it is the greatest delusion that ever was!"

Professor Pritchard, of the Royal Veterinary College, before the same commission, said: "With regard to dogs, I should never think of applying chloroform to them. I should think it very unsafe to do so."

The English "Handbook of Physiology" distinctly omits anæsthetics from a great number of its most painful experiments; and licenses to experiment *without anæsthetics* are constantly being granted in England.

The forms of experiment vitiated by anæsthetics are: —

a. On sensibility and the nervous system.

b. On the vital organs, circulation, etc.

c. With drugs.

d. With diseases by inoculation, etc., and all experiments requiring a long duration of time. To this list may be added experiments on drowning, starving, baking, etc.

Dr. Lauder Brunton says that "the reflex action of the nerves cannot be got from animals insensible from anæsthetics or narcotics."

Magendie says: "Pain is an important guide."

Professor Elias de Cyon, of St. Petersburg, says: "If the experiment concerns the influence of the circulation on the activity of the glands, it is best to avoid these drugs on account of their influence on the circulation."

Professor Rutherford acknowledged before the Royal Commission that when anæsthetics interfere with due result, which is the case with him about *half the time*, "no anæsthetics are given."

So much for real anæsthetics. There is, however, a "false anæsthetic" extensively employed by vivisectionists, and its name is "*curare*."

Curare is a drug used in laboratories for the purpose of paralyzing the *motor* nerves of the animal, so as to render it incapable of making the slightest movement. At the same time the sensitiveness of the sensory nerves is not diminished, but on the contrary is supposed by some to be increased. Under the influence of curare the animal cannot breathe of itself; and artificial respiration is established through a tube thrust into the windpipe.

Curare has been tried on human beings, who remembered all the pain they suffered, although unable to stir. (See Bernard's "*La Chaleur Animale.*")

Sir Thomas Watson, before the Royal Commission, said that to treat curare as an anæsthetic would be, in his opinion, "a fraudulent trick."

Professor Holmgrén says of this drug: "This venom is the most cruel of all poisons. It changes us into a living corpse, which knows everything but is unable to move a single muscle."

Curare has not the injurious effect of chloroform; therefore its use is constant, while that of anæsthetics is only partial and temporary. The great extent to which it is used may be seen by consulting the medical reports.

Claude Bernard, in a physiological work, says, that we may "take it for granted that experiments when not otherwise described are performed on *curarized* dogs;" and their condition he himself describes as "accompanied by the most atrocious sufferings which the imagination of man can conceive!"

Professor Julius Cohnheim states: "The great majority of our experiments were made on dogs under *curare* and artificial respiration."

From the above we conclude: 1. That curare does not in the slightest degree diminish pain. 2. That its use is almost universal.

As to the uncertainty of all anæsthetics from their very nature, the evidence is strong. The prostration of the system after an operation in which anæsthetics have been

used, seems to point to the conclusion that pain has been suffered, although the memory of it is lost. Certain experiments with anæsthetics produce *manifest* pain; and medical opinion is at variance as to the possibility of eliminating pain under any conditions. The writer has heard the testimony of those who declared that they suffered almost death from the effect of the anæsthetic itself.

Dr. Rolleston, of London, (evidence before Royal Commission) said: "It is not so easy to know when you have an animal thoroughly anæsthetized. The whole question has an element of uncertainty about it."

Dr. Erichsen has given his testimony that "chloroform does not remove the physical impression produced on the system by a severe mutilation."

Claude Bernard says: "Morphia renders dogs immovable, but sensibility remains." *(Revue des Cours Scientifique*, vol. vi. page 263.)

From what we have learned as to the rare use of anæsthetics, the general use of curare, and the uncertain effect of chloroform, morphia, etc., we must therefore conclude that the sufferings of vivisected animals are not mitigated to any appreciable extent.

a. In order to estimate the cost of vivisection in animal suffering, it is necessary to ascertain, —

1. The nature of the experiments.
2. The extent to which they are carried on.

Those who may be curious to read from the original descriptions of these operations are referred to the works of Claude Bernard, Paul Bert, Brown-Séquard, Richet, Béclard, Cyon, in the French; Goltz and Schiff, in the German; the English "Handbook of the Physiological Laboratory;" Dr. Austin Flint's American "Physiology of Man;" and the medical reports in general. Bernard's "*Leçons sur le Diabète*," "*Leçons sur la Chaleur*," and "*Physiologie Opératoire*," and Cyon's "*Methodik*," will be found very vivid in their descriptions.

The following are examples of experiments frequently performed. When the absence or imperfect use of anæsthetics is considered, the real nature of what is being done around us can be in a measure conceived.

In the *Journal of Physiology*, vol. i. page 155, a description is given of the experiments of Dr. H. Newell Martin, Professor of Biology in Johns Hopkins University at Baltimore. Dr. Martin removes the brain from animals, and then observes the attendant phenomena for one or two *weeks* without giving food. He says they "do better without the exhausting struggle which the attempt to open the mouth occasioned."

Professor Ott, of the same university, opens the spinal column of cats, and applies electricity to the spinal marrow *without anæsthetics*. *(Journal of Physiology*, vol. ii. p. 42.)

Professor Senn, of Chicago, tears the *pancreas* of an

animal in two. Animal is left for *weeks* to note result. Death occurs from agonizing diseases, — peritonitis, gangrene, etc. (*International Journal of Medical Sciences*, July, 1886.)

Dr. W. B. Platt, of Baltimore, watches for twenty-six hours the agonies of a dog poisoned with "resorcin." (*American Journal of Medical Sciences*, January, 1883.)

Dr. ————, of Harvard, keeps a cat alive for *hours* by artificial respiration (under *curare*), while the *bare sciatic nerve* is stimulated by electricity. Object: to find out whether the nerve would be exhausted. (*Journal of Physiology*, vol. vi. p. 133.)

Friedrich Goltz, of Germany, washes out portions of the brains of dogs, and studies their actions for *months*, till they die of inflammation of the brain. After death, the brain "resembles a lately hoed potato field." (*Pfluger's Archives*, vol. iii. p. 178.)

Dr. Brown-Séquard lays bare the spinal cord in over twenty different *species* of animals, and experiments on them for *months*. (*Lancet*, vol. i. p. 823.)

Dr. H. H. Robt. Koch produces "exquisite peritonitis" by injecting *tubercle bacilli*. (*Medical Times*, August 26, 1882.)

A. Chauveau opens with chisel and mallet the spinal column of eighty horses and asses, and experiments on the spinal marrow. No anæsthetics. (*Journal de Physiologie*, vol. iv. No. 13.)

Professor Mantegazza experiments on effect of *pain* on digestion. Prolongs the agony for *one month*. (*Lancet*, March 25, 1871.)

Professor Chossat starves twelve animals to death. (*Gavarrett's* "*Animal Heat*," p. 394.)

Professor Donders pours *concentrated acetic acid* on the eyes of rabbits. The *pupil* disappears in four weeks. (*Béclard's* "*Traité de Phys.*," p. 1019.)

One of Magendie's experiments was to cut the cerebellum, and cause the *rotation* of the animal. This would last *for days*, "almost without interruption."

In *Scientific American*, November 29, 1890, an account is given of the grafting of a dog's leg to a boy's leg. Animal is strapped twelve days immovable. Its vocal cords are cut. Great care is taken that the animal does not have *too much anæsthetic*.

But enough has been cited of these atrocities to give a partial idea of the real nature of vivisection. As to its extent, investigation shows this to be enormous. Thousands of animals thus perish every year. Bryan's "Vivisectors' Directory," of 1884, gives 470 names as a list of licensed vivisectors in Great Britain, with leading experimenting physiologists in foreign laboratories. Over thirty well-known American physiologists use this method. In Professor Schiff's laboratory 700 animals per year have been vivisected simply as an illustration to lectures.

Orfila poisoned 6000 dogs in his experiments in toxicology. There are over 150 laboratories in Europe alone, with nearly 250 physicians attached. Besides the well-known body of professional vivisectionists, great numbers of "would-be" physiologists are everywhere engaged in this work.

Louis Pasteur, of Paris, says: "The experiments (inoculating dogs with rabies) which we have carried out have passed beyond the possibility of numbering them." (*Medical Times and Gazette*, August 23, 1884.)

Dr. Edward Berdoe, Member of the Royal College of Surgeons of England, in a letter dated April 1, 1890, to Philip G. Peabody, of Boston, says: "So far from there being the slightest exaggeration, I can testify from my own knowledge that the atrocious cruelties which you condemn are *daily* and *hourly* performed in the physical laboratories of the world."

Moreover, there exists an immense business of manufacturing elaborate instruments used by vivisectionists. This traffic alone indicates the extent of what occasions it.

These facts force the conclusion upon us that the barbarities of this practice are almost beyond the imagination to conceive.

Professor Pritchard, of the Royal Veterinary College, and an experienced operator, testified that 'he had never seen anything to make him think differently than that as regards the physical sensation of pain, it would be equal to that in a human being.'

Animals do not, like man, faint from pain, but suffer to the last.

Edward Mayhew, an experienced veterinarian, in "The Dog and its Management," says that "on account of the highly developed nervous system" of this animal, dreadful as hydrophobia is to the human being, rabies (the disease which Pasteur is continually propagating) is *worse to the dog*."

The English Royal Commission of 1875 in their report gave this opinion: "It is manifest that the practice of vivisection is liable to *great abuse;* that inhumanity may be found in persons of very high position as physiologists."

b. An important phase of the cost of vivisection is seen in its moral effect upon mankind.

It is a very trite but true saying, that the force of habit is strong. The system, both physical and mental, accustoms itself to its environment.

Thus it happens that the sight of suffering by degrees produces less and less effect upon the mind of the operator, until the result is callousness and hard-heartedness. The force of habit is seen not only in the commission of evil but in the omission of good. The sympathetic sense can be slowly diminished by lack of use till it becomes almost rudimentary. Dr. George Rolleston, of London, has said:

"Vivisection is specially likely to tempt a man into certain carelessness, — the passive impressions caused by sight of suffering growing weaker, while pleasure in experimenting grows stronger by repetition." The constant sight of suffering has thus a tendency to deteriorate the moral nature. The best people in other respects may become so morbid from intense study of one subject, as to lose the idea of morality in connection with that subject. In this way only can we explain the fact that in these "happy and free" United States, and concealed in institutions of education and philanthropy, are these inquisitions of to-day.

The moral effect of his practice on the vivisector can be seen from his own acknowledgments. Claude Bernard, in his "Introd. à l'étude," p. 180, says: "A physiologist does not hear the animal's cries of pain; he does not see the blood that flows. He sees nothing but his idea."

Prof. Emanuel Klein stated before the Royal Commission that he "*entirely disregarded* the sufferings of animals in making experiments;" and believed that "that was the *general practice* on the Continent and in England."

Now this moral condition of the vivisectionist must have its effect on the community, and in three different ways: —

1. Directly on the sick.
2. By example to students and others.
3. On society and posterity.

1. It is evident that this hardening of the sympathetic nature of a physician is liable to react upon the sick under his charge in careless and unfeeling treatment. But this is not the only way in which the patient will suffer. The same mental temperament and condition that delights in experiments on animals would prompt experiments on human beings, as has often been done.

Prof. Cyon says: "Many a surgical operation is performed less for the benefit of the patient than for the service of science." ("*Methodik*," p. 8.) This tendency in the direction of crime against human beings is seen in the experiment, described in the *Lancet* of November 3, 1883, in which Dr. Ringer practises on men and women with nitrate of sodium, inducing symptoms of violent poisoning, prostration, etc. This was done from motives of curiosity.

2. The evil effects of example on students and others who witness these experiments cannot fail to be great. The youth who largely comprise these medical classes are at an age when examples given by those they are taught to respect have a powerful influence. At that age they should not be hardened to the finer feelings of sympathy.

Dr. Haughton's declaration before the Royal Commission carries truth with it: "I would shrink with horror from accustoming large classes of young men to the sight of animals under vivisection. Science would gain nothing, and the world would have let loose upon it a set of *young devils*."

3. The remoter effects upon society and posterity are just as certain.

No influence is lost among the world's myriad forces. There are moral influences which sometimes seem to possess whole peoples as with an epidemic disease; how, we do not know. The fever for vivisection seems to have taken possession of the medical body, and in the face of facts. There is danger that, if it is not quelled, its moral apathy as well as its medical delusions, may almost universally occupy the professional mind. There is danger also that, through published accounts of the alleged labors of scientists "in behalf of humanity," this moral callousness to the feelings of others may extend to even the general public.

Another great influence not to be overlooked is heredity. The suffering caused by a vivisectionist to his subject, in his medical practice and by example, is not the only evil that can be traced to his methods of experiment.

"Like begets like," and the influence of a cruel and calloused nature will be felt in future generations.

In our investigation of the results and cost of vivisection, we have found:—

1. That the results naturally and practically are small and unsatisfactory.

2. That the cost in suffering and moral effect is great.

We therefore conclude that the cost is not justified.

There is another phase of the cost of vivisection, which although unimportant in comparison with the considerations mentioned, nevertheless should be stated. The cost in energy, time, and wealth thus wasted and worse than wasted is in itself no trifling matter. Directed into proper channels, these forces would accomplish vast and useful results.

4. We have so far considered vivisection from a standpoint of utility; let us now judge it from a standpoint of principle. Is or is not this method intrinsically wrong?

The first question that suggests itself in the examination of the moral aspect of vivisection is this: Are there such realities as justice and duty? Or have the lower animals no rights, and have we no duties towards them?

It is written in the human conscience that if we have duties at all, we have them with regard to everything that can suffer; that, if there be such a thing as justice, *all* should share its benefits.

Selfishness is the "root of all evil;" and is exemplified in the idea largely occupying the human mind that everything outside of its own species is entitled to no consideration. The eternal principles of justice, however, will not be bounded by such narrow limits.

It is axiomatic that we have no right to do wrong that good may result; for how shall the limit be set, and the justifiable proportion fixed between the wrong and the

wished-for benefit? There should be no compromise of right with wrong. It is a dangerous principle that has been the excuse for every atrocity.

Cruelty is not justified because done for the benefit of others; for it is self-evident that the infliction of suffering, undeserved, and not for the benefit of the sufferer, is contrary to the *eternal fitness of things*. It is the *undeserved injury* we have to consider, and not *upon what* it is inflicted.

In the words of Bishop Butler's axiom: "On the simple fact that an animal is capable of pain, arises our duty to spare it pain."

In the application of these principles to our subject we see that, whereas it should be the noble object of the highest species to lessen suffering wherever found, it is, instead, engaged in inflicting tortures upon lesser species for its own selfish ends. In the workings of justice there is a law of *compensation*, but what compensation has the vivisected animal? One individual of the same species has as great a right to torture another, as one species to torture another; and there is no excuse that could be given for this practice that would not apply as well to the torture of *human* beings.

What if a superior order of beings should torture *us*, as suggested in "The Modern Rack?" Would the vivisectionists consider it right? And if not, then why *now* is it right? We thus see that not everywhere is self-preservation the "first law," and that it is a sign of the highest civilization to regard the rights of the weak and defenceless.

The vivisectionist claims that his object is good. We have seen that this does not justify his act; but, on the other hand, is his motive always worthy? Is it probable that he who with stony heart and steady hand inflicts upon helpless animals the tortures we have described, would agitate himself greatly upon the subject of *human* misery? Reason will answer, No. "But," it is argued, "good results may nevertheless follow from his efforts." To this reason replies: "The aims of the vivisectionist are in a different direction; and objects of curiosity and personal ambition will be advanced to the exclusion of less attractive but more worthy ends."

Dr. Charles Richet, in *Revue de deux Mondes*, February 15, 1883, confesses that "it is not desire to relieve human suffering or advance utility that animates these men," but simply "scientific curiosity."

Dr. George Hoggan (*Fraser's Magazine*, April, 1875), in speaking of his experiences in the laboratory of a celebrated French physiologist, says: "The idea of the good of humanity was simply out of the question, and would have been laughed at; the great aim being to keep up with and get ahead of one's contemporaries."

Here, then, are seen the secret motives of the vivisectionist, — ambition and rivalry. Is it fitting that parties thus interested should decide the right or wrong of a question?

The result, then, of our consideration of vivisection from a moral standpoint, is that this practice is inspired directly and indirectly by selfishness, and that it is inherently wrong. It is enough that we are often compelled to witness the abuse of animals by the ignorant. The spectacle should not be forced upon us in this nineteenth century of our learned "savants" descending to the depths of barbarity, and excusing their own selfishness by appealing to the selfishness of others. It is inconsistent to punish a huckster for beating his horse, and allow a professor to cut one to pieces.

As to partial restriction and legal regulation of this practice, it is not difficult to show that any such efforts would be useless, and for the following reasons: —

1. A law that would be a proper protection to the animal would be practically prohibitory to the vivisectionist.

2. Such a law, at the same time licensing and protecting, would not be carried out.

1. When we consider what has already been learned as to the unreliability of anæsthetics themselves, the imperfect manner in which they are *necessarily* used in the great majority of cases, and the many instances when they cannot be employed at all, it is evident that the small residue of cases, if any, when they could be effectively used, would be practically worthless to the vivisector. Therefore, it is more consistent and logical to stand upon the basis of prohibition, and avoid unnecessary cumbering of the statute books with complicated regulations.

Moreover, from various motives, law-makers would be more favorably disposed towards a simple than a complex measure for the reform of an abuse.

2. That such a proper restricting law would not be carried out, is founded both on — *a*, reason; and *b*, historical evidence.

a. The ineffectiveness of such a law is evident for the following reasons: —

1. The sanction of the law has a tendency to shield abuse.

2. The motives for evasion would be great.

3. The difficulty of supervision would be insuperable.

1. Such a law, through legalizing the practice, would but serve as a cloak for all kinds of inhumanity to animals. The public would be satisfied, and the torturers left to their work.

2. The motives for evasion include: —

a. The necessity for dispensing with anæsthetics, as we have seen.

b. The trouble and expense of complying with the law, involving the careful administration of anæsthetics.

c. The feeling of antagonism would be a powerful motive. Interference of the public is considered by vivisectionists as impertinent; and each experimenter claims the right to be

autocrat in his laboratory. "Anything that they consider necessary," according to Dr. Burdon-Sanderson, "should be allowed."

Dr. Ferrier, before the Commission, said: "I should certainly object to inspection of any kind in my experiments."

"For the public to interfere," says Dr. Sharply, "would be a *barbarism*."

3. As to the difficulty of supervision, there is a well-known saying that it is foolish to play with a gambler at his own game. It is likewise foolish to attempt to supervise a practice in which the supervised have at command all the means for deception. Even if the inspection were adequate, it would have to be *constant*. Dr. Haughton, himself a defender of vivisection, said before the Royal Commission: "I know the practice is to use the anæsthesia very imperfectly; and when the controlling eye is gone, *to drop the use of it altogether*." Moreover, those skilled in the intricacies of chemistry can easily make black seem white to the law, especially when ostensibly working "for humanity." *Curare* could be administered secretly; and in case of complaint no proofs could be obtained on account of conflicting testimony.

The result of these difficulties would be carelessness in supervision, which, intensified by the moral sanction of the law and the motives for evasion, would finally cause such a restrictive measure to become simply a matter of form from which the spirit had departed.

b. Historical evidence is to the effect that a compromise of this kind has always resulted disastrously to reform. The friends of humanity in England in 1875 agitated the question of vivisection, and the result was the *Vivisection Act* of 1876. Notwithstanding, however, the strenuous efforts of the Victoria Street Society, the measures of this Act were so tampered with and so inefficiently carried out as to practically leave the whole power in the hands of the vivisectionists. After four years' labor, the Society concluded that the only true and safe course is *prohibition*.

In Dr. Berdoe's "Twelve Years' Trial of the Vivisection Act," it is shown that under that Act vivisection flourished more than ever.

Since a restrictive law would be folly, and the exigencies of the case demand a more speedy method than that of education alone, the only remedy is clearly prohibition.

The question is, can a prohibitory law be enforced? And the answer is plainly, yes, for the following reasons:—

These experiments are performed either in public before classes, or in private for purposes of alleged scientific advancement. It is evident that all experiments of the first kind would be abolished; and as for the rest, the great motive of ambitious desire to be renowned in "discoveries" and quoted in published medical reports would be absent.

A fear of detection would be substituted, for the public would oppose the practice.

Thus, motives for its continuance being absent, the practice itself would be abandoned.

When that time shall come, then life to many hapless creatures will cease to be an undeserved curse, — life which, as Buddha wrote thousands of years ago, —

> "Is dear even to the meanest; — yea, a boon to all
> Where pity is; for pity makes the world
> Soft to the weak and noble to the strong."

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VIVISECTION.

BY JOHN A. MACPHAIL, B.A., M.D., 6 UNIVERSITY STREET, MONTREAL.

There are questions of science and questions of sentiment, but there are questions in which both are combined. To this last class vivisection belongs, and the present aim is to establish the proper relation existing between these two factors. Much work has been done on this subject at different times, and evidence has been adduced on both sides by the staunchest opponents; at least the evidence was recorded, but no systematic attempt has been made at a summing up from which any plain, unprejudiced mind could draw an authoritative conclusion. All that now remains is to consider the evidence offered along with the facts that have arisen since that time, and to point out on which side, according to all reasonable rules, the decision must lie.

The store of published facts concerning vivisection in America is singularly small, because in this country it has never really become a public question, but in England, on the occasion of the first attempt at restrictive legislation fifteen years ago, the conflict between those who favored the practice and those who opposed it was singularly keen.

There are two classes of persons working to lessen pain; those who oppose vivisection, striving to prevent the sufferings of animals, and the vivisectors, whose motive is the seeking after truth and knowledge which will go toward alleviating the sufferings of humanity, and of the animals themselves, through scientific medicine or applied physiology. That these two classes, who have a common aim, should hold views so conflicting, must be due to some misapprehension which it is intended the present exposition of facts will help to remove.

If it can be shown that the pain and death which vivisection implies have been wrought for the good of humanity, by leading to knowledge, light, and power, and that this knowledge, light, and power could have been arrived at in no other way, and that these are so considerable that mankind would be badly off without them, then the case for vivisection may be considered proved. What restrictions, if any, should be laid upon the practice, is to be considered afterwards.

By vivisection is to be understood the operating with cutting instruments or other means on the bodies of living animals.

The objections advanced against it are mainly two, — the cruelty involved, and the consequent injury to the moral

nature through the infliction of a wrong; but it is also urged that the practice is not justified by the results. It will first be necessary to estimate the amount of pain actually caused, for it is in this the principal fallacy lies.

In the transition from life to death there are three stages: the first marked by loss of consciousness, the second cessation of breathing and heart action, and the third is initiated by those changes that characterize the rigidity of final death and decomposition. An animal may have life and not be "living," that is, it may be alive, but unconscious, and without the capacity for suffering pain. It is under these conditions, induced by anæsthetics, that most vivisection is performed. The heart may be in full working order, the respiratory movements unimpeded for hours after consciousness has disappeared, and, in the case of cold-blooded animals, even for days. Operations performed on such an animal are rightly classed under the head of vivisection, but to brand them as improper is as unreasonable as to charge the skilful surgeon with cruelty, who uses all care in removing a tumor from a living but unconscious patient. By the use of those anæsthetics which physiologists habitually employ, the animal is rendered unconscious. This is the moment the vivisector chooses for his work. He brings into use the instruments of his research. He watches the ebb and flow of blood, the throbbing of vessels, and takes tracings of them; he measures their force; he gathers the juice a gland secretes; he divides one nerve and stimulates another or poisons a third. He records his observations, and finishes a painless but profitable death in one of a variety of ways. Just as anæsthetics have rendered the surgeon's task a simple one, and enlarged his sphere, so they have rendered new experiments possible, and have become as great a necessity in physiology as in surgery.

Dr. Yeo submitted the following estimate as to the proportion of operations that caused pain: —

Absolutely painless	75
As painful as vaccination	20
As painful as the healing of a wound	4
As painful as a surgical operation	1
	100

This is on the assumption that the capacity an animal has for suffering is equal to that possessed by a human being. As a matter of fact, the cases in which anæsthetics interfere with the progress of an experiment are exceedingly rare, except in certain researches on the functions of sensory nerves; but these functions have already been worked out; and as it now stands the percentage where pain is an essential factor is very low. The public mind has been befogged by the use of a single term, "vivisec-

tion," for two separate things: experiments upon sentient and non-sentient animals. It would be easy, one would think, to distinguish between these two; yet Miss Cobbe, speaking for all opponents of vivisection, says, "We find it practically impossible to separate torturing from non-torturing vivisection;" and Mr. Bergh implores pardon for saying "that if the rose would smell as sweet by any other name, surely the blood of tortured animals would also retain its repulsive odor under any other designation."

The question whether vivisection is good or bad is not affected by saying that there are other things equally wrong,—the agonies caused by sportsmen to birds dragging their wounded bodies to some hidden covert, the piercing cries of the hunted hare, the suffering of the brave fox as his living body is to be torn by the pursuing hounds; or that the pain caused by vivisection ever since it was practised is as nothing compared with the suffering animals undergo in transportation and in slaughter-houses, for the satisfaction of man's bodily needs; or to assert that in every agricultural community male animals are every day being vivisected for their more complete mastery, or to show that the ghastly scenes anti-vivisectionists conjure up from physiological laboratories with their "torture troughs," represent no such cruelty as is depicted in Snyder's "Boar Hunt," or in Landseer's "Death of the Otter." It is also useless to point out that the most earnest vivisector may be an ardent lover of animals, and that his deepest endeavor is to alleviate their suffering in common with that of mankind, or to affirm that their opponents are actuated by an unmanly sentimentalism.

First, there is the principle that should govern man's conduct in relation to animals. Without swearing to the words of any teacher, or committing one's self to any school, it may be laid down as a truth that life is a struggle, a struggle with fellow-men, with living beings, animals, and plants, and with the lifeless forces around us. The conditions in which men find themselves inevitably lay upon them this burden, and they are obliged to use the means they find around them in this struggle, amongst which are the lives of animals. If, then, man is to prosper, he must kill animals, it may be tigers, sheep, or vermin. It is a duty imposed upon him by nature, even if a painful duty, but self-preservation demands it. The rule cannot be laid down that an animal may be killed for one purpose and not for another, that life may be taken to gratify an appetite or nourish the body, but not to increase the existing store of knowledge or benefit the mind. The only test is whether the death of an animal is likely to be of benefit to society at large. Man must be fed: he is justified in killing and eating sheep; man's success in this struggle for existence depends on superior knowledge: he is justified in killing a frog or rabbit if it can be shown that human

knowledge is thereby enlarged. But he is not justified in causing pain if it can be avoided, or unless pain is of advantage to him. Death is painful in itself, but that does not mean he is to abstain from killing; it means that he is to kill with the least possible pain. One could imagine a costly system of anæsthetizing animals about to be slaughtered, but no one has shown it to be practicable, just as a surgeon may not find it practicable to administer chloroform where some local anæsthetic, like cocaine or the ether spray, would serve the purpose nearly as well.

It was pointed out that to justify vivisection the information must be obtainable in no other way. Let this be qualified by saying "in no other reasonable way," and to illustrate, place the only two ways that are in any way reasonable, side by side. Take cholera, for example, in which experiments have been conducted on both principles. On the one side are the scientific infection experiments of Thiersch, and others following him, performed by vivisection; on the other hand are the popular experiments which have at various times been performed during cholera epidemics on human beings, by companies supplying them with water and other commodities. Even the most confirmed anti-vivisectionist will commend the former way. But even if this knowledge could be arrived at in "some other way" at some future period, what of the suffering and death that must in the meantime come to the human race? What of those who must die unaided till the light comes in some hypothetical and mysterious way, and of those now living whose lives are due to their laying hold of the remedies and the prophylactics which vivisection has brought?

But it is not certain that the knowledge could be obtained in any other way, for the discovery of the lethal agents in the transmission of disease was only and could only be determined by means of experiments on living animals.

It remains to be proved that the human race has benefited considerably by the results obtained from vivisection. To discuss this in detail would involve the tracing of every step in the progress of medicine, for medicine is no longer an art to be practised by rule of thumb, and whatever progress it has made is due to observation and experiment. There was ground for the mocking words of Voltaire when he jeered at physicians "pouring drugs, of which they knew little, into bodies of which they knew less." They were doing their best in those pre-vivisection days. They gave the white spots on a leaf to consumptive patients; they gave the carrot in jaundice because it was yellow; for kidney diseases they gave fruits which resembled that organ. They were groping in the dark, unaided by the light of experiment, and men were dying around them of complaints that to-day it is unnecessary to feel.

Contrast the present position of medicine with that of fifty years ago, and you have a measure of the value of experiments, for the most part performed on living animals. Experimentation on animals for the benefit of humanity is the keynote of modern medicine, and the physician who underestimates its value is out of time with the best that is said and thought on the subject. Physiology is at the basis of rational medicine, and it is to physiology the physician must seek if he would be anything more than a "medicine man," a dispenser of chance-gotten drugs. Experimental pathology is the synthesis, as clinical diagnosis is the analysis, of disease, and physiology reduces the facts to a system. If physiology consists in the study of vital processes going on in living organisms, it follows that many of them must be studied as they actually take place. It is useless to appeal to the dead body, for though there the changes can be noted, the processes will have passed away. In the dead body there is no disease, for, as Virchow remarked, disease presupposes life.

It will be possible to refer only to the most notable examples of vivisectional results in relation to the practice of medicine, but enough will be given to obtain for it the justification of practical utility. Vesalius, the founder of anatomical study, states in his work on the human body that it was through experiments on living animals he was led to his wide generalizations in anatomy, which before his time consisted of shreds and patches of crude observation and false induction. Harvey, "having frequent recourse to vivisections," received the first hint of the circulation of the blood by watching the palpitating heart of a living creature. Haller, who by his doctrine of "irritability" laid the foundation of the true physiology of the nervous system, wrought through pain and death to animals. Charles Bell and Magendie traced out the distinction between motor and sensory nerves, and Marshall Hall demonstrated by vivisectional methods the occurrence and importance of reflex actions, by which one-half of our life is controlled. Weber demonstrated in the same way the inhibitory action of the pneumogastric nerve upon the heart, and laid down the principles of a rational treatment for the prevention of heart failure in diphtheria and other acute diseases. Du Bois-Reymond, Pfluger, Flourens, Brown-Séquard, Schiff, Vulpian, Goltz, Waller, in fact all physiologists, by their work attest that if physiology is not a hopeless puzzle and a baseless fancy it is due to the results of experiments on living animals. The chemistry of living beings was worked out in the same way by Lavoisier and Priestly, who first made out the chemistry of respiration. The chemistry of digestion and nutrition would yet have been a phenomenon and a guess if it were not for the labors of Schmidt and Bidder. Fever and inflammation, old mystic words, were never understood till Claude Ber-

nard and Cohnheim made their researches on the vaso-motor nerves of living animals. It was by vivisection Aselli and Pecquet discovered the system of lymphatic vessels, and Malphigi the capillary circulation. Artificial respiration was made a practicable means of resuscitation by Vesalius, Hooke, and Lower, through experiments made upon dogs. The experiments of Rev. Dr. Hales on pressure of the blood in the arteries are also to be noted. In the seventeenth century Sir Christopher Wren and other Fellows of the Royal Society experimented on the transfusion of blood, and recently it has been made a means of saving life. In 1835 a committee of physicians at Dublin showed how heart sounds are produced, and enabled clinicians to diagnose the various forms of heart disease. Duhamel, in 1740, Sir Astley Cooper in 1820, Syme in 1831, and more recently Ollier and others, have conducted experiments on living animals to show the processes by which wounds are healed and injured parts restored, and especially how fractured bones are united, the practical results of which are inestimable. The surgery of the old days has been robbed of its horrors through the results of vivisection. The "fearful fear of hemorrhage" that the old surgeons felt is now groundless, through the experiments made in ligaturing the arteries of animals. By this simple process the boiling oil, the vitriol and caustics, the hot searing irons and receptacles for blood are no longer seen at an operating table where the surgeon is willing to avail himself of the benefits derived from vivisection. It was by such experiments the Esmarch, a bandage applied to a limb about to be amputated, to prevent the flow of blood, came into use. This inaugurated bloodless surgery. The principles of antisepticism were studied on animals, and with the introduction of aseptic methods all dread of pyæmia, fever, tetanus, and secondary hemorrhage have disappeared. Inflammation is no longer a formula, "redness, swelling, heat, and pain," since by the experiments of Bernard, Virchow, and Cohnheim, and later by Redfern and Von Recklinghausen on the blood-cells in the leg of a frog and the eye of a rabbit, its secret has been pierced, and following it new knowledge of abscesses, ulceration, gangrene, and clots. The present abdominal surgery had its origin in vivisection. In the American Civil War, out of 3717 cases of wounded intestines, 3273 ended fatally. A series of experiments was conducted in Chicago, in which thirty-seven dogs were etherized and shot, when the feasibility of opening the abdomen was proved. The percentage of fatal cases after such injuries at present is twelve; before this experiment it was eighty-eight; that is, the position is exactly reversed, and if they had been performed before the Civil War 3273 soldiers instead of 446 would now be living, and their injuries would not even be considered grave enough to entitle them to a pension. Sir Spencer

Wells, by operating on dogs, introduced the practice of suturing the peritoneum, and reduced the percentage of fatal cases from thirty-four to eleven. Out of 1,000 cases of his, 769 were saved, and 17,800 years added to the sum of human life. Martin, of Berlin, in the same manner proved the possibility of ovariotomy, and performed this operation, which a few years ago used to be denounced as murderous, in 130 cases, with only one fatal result. By these observations on the opening and suturing of the peritoneum of animals, and the treatment of the pedicle by ligature, abdominal surgery is now a matter of routine.

Another feature in modern surgery is the progress made in operations on the brain, and all of these are based on experience gained by vivisection. Hitherto the brain was looked upon as the "oracle of God," but Dr. Ferrier, by his experiments on animals, demonstrated the location of sensory and motor functions in the cerebral hemispheres as clearly as if the skull and membranes surrounding the brain were transparent.

Dr. MacEwan, of Glasgow, in one year saved the life of ninety patients by following Ferrier's methods.

In one year Dr. Echeverria collected 165 cases of epilepsy, of which seventy-five were cured by following the principles of localization laid down by Ferrier; yet for these experiments the eminent doctor was haled before the magistrates as if he were a burglar or a swindler.

Thousands of patients died from malignant affections of the kidney till Simon, at Heidelberg, demonstrated on animals the possibility of its extirpation, and the performance of the excretory function by a single organ. It was by an experiment of this kind, inoculating the udder of a cow to produce a vaccine pustule, that Jenner was aided in his great discovery of a preventive of small-pox.

By the experiments of Gerlach it has been shown that tuberculosis in cows can be communicated to healthy animals, such as man, fed upon their milk,—that the disease may be induced by tubercular matter being inhaled or taken into the stomach,—facts of importance in relation to the prevention of the disease. By the sacrifice of a few dogs and rabbits information is obtained which may have, and as a matter of fact has had, an important bearing upon the safety of the human race.

But the most brilliant vindication of vivisection is now under our eyes,—the results that have attended Dr. Koch's experiments upon animals, by which tuberculosis, that disease which carries off twelve out of every hundred human beings, is likely to be stayed. These results were arrived at by making on a few mice experiments which men for generations have in blind ignorance been making on themselves. Cholera has already been referred to, and since 1884 Freire, in Brazil, has been working to obtain a specific against yellow fever along vivisectional lines, and is only

waiting for an epidemic to put his results at the service of mankind. Rev. R. M. Luther, a missionary in India, by vivisection obtained an antidote successful in sixty cases out of a hundred of bite by the brown viper, and with it saved the life of a fellow worker, who was afterwards instrumental in inducing 2,000 natives to embrace Christianity. Dr. Wood, by "baking alive" at 120° a few dogs, explained the treatment of sunstroke. The only gleam of hope that has ever come to a patient affected with those terrible maladies, diseases of the kidneys, has been through Bernard's experiments on the formation of glycogen in the liver, and until the mystery is cleared up by the death of more animals, the treatment of these diseases must remain a matter of empiricism. Whatever of good Pasteur has conferred on mankind he has accomplished by vivisectional methods, and yet the results are out of all proportion to the pain inflicted. There is a danger of becoming technical in pointing out that through observations made upon the tadpole by Arnold it was found out that blood-vessels are formed by the hollowing of protoplasmic cells, and to enter upon a discussion of what embryology owes to vivisection would take one far beyond the present limits and the needs of this discussion. The modern method of pharmacology is based on vivisection. Instead of "experimenting" on patients, the effect of a new drug is tested upon such plants as the algæ and fungi, and then upon the frog, rabbit, or dog. Its mode of action is exactly ascertained, and the physician knows what organs and structures will be affected, how they will be influenced, and the changes which will be produced by the progress of a disease. Even if the charge were true that vivisection had never added a drug to the pharmacopœia, it would prove nothing, for it is the work of the vivisectionist to test the effects of existing drugs and define their uses. A few instances will suffice. If nothing were ever learned by vivisection but the action of digitalis upon the heart, the pain caused would be abundantly justified. Bromide of ethyl was brought forward as an efficient anæsthetic, but a vivisectionist, by the death of a few dogs, prevented a series of those dreaded accidents, — death on the operating table, — which would have followed its use. By operations on animals Bernard discovered the hypodermic use of drugs, and Magendie of strychnine. Traube explained the real nature and use of digitalis, and Maure of saline purgatives. Luchsinger, following up the clue obtained from experiments on dogs, demonstrated the value of strychnine as a preventive of night sweats in consumptive persons, and by the same means nitrite of amyl was shown to allay the agony of angina pectoris, and pepsin to be of value in dyspepsia. In the same way jequirity was introduced in ophthalmic surgery, nitrite of amyl in epilepsy, salicylic acid in rheumatism, jaborandi in dropsy, iodoform as an

antiseptic, and the bromides, chloral, and paraldehyde as analgesics. All the new drugs, — antipyrine, exalgine, and antifebrine, — that have cooled so many fevers and alleviated so much suffering, were all tested and their effects proved on animals. Who would have dared to use cocaine on the human eye, like all anæsthetics "God's best gift to his suffering children," with all the risk of inflammation, if its effects had not first been ascertained on animals? But this charge is not true, for Dr. Lauder Brunton has shown that between 1864 and 1867 seven drugs were added to the pharmacopœia, and from 1867 to 1874 eleven were added.

Commercially, vivisection has been of the greatest practical importance. Dr. George Fleming, in his work on veterinary science, makes some estimate of the results. In one district in France sheep to the value of £213,600 died in one year of anthrax, and in Russia 100,000 horses died annually till Braueil, followed by Delafond, Davain, Chauveau, Toussait, and Pasteur, perfected the knowledge of the poison and showed the means by which its energy may be abated. The desolating scourge of the cattle plague was stayed, and the silkworm disease was brought under complete control by Pasteur. Smallpox of sheep, the swine plague, and distemper of dogs and chicken cholera, can be prevented by inoculation. The exact method of the propagation of pleuro-pneumonia in cattle has been made out, which is the first stage in discovering a remedy. The ravages of splenic fever in cattle and analogous diseases of horses and sheep have ceased since its nature and mode of prevention have been discovered by vivisectional methods, and hydrophobia is now robbed of its terrors. Glanders, a disease "as infectious as syphilis and as fatal as tuberculosis," can only be diagnosed by the method of inoculating animals.

Another use vivisectional experiments have been put to is in the detection of murderers who have resorted to poison. The notorious Lamson, who was executed in England in 1883, may be mentioned. He used aconite to kill his victim, and the presence of the drug was only proved by its effects on small animals. If it were not for this man's secret, poisoners might enjoy all the immunity that was formerly obtained in the days of the Borgias.

The testimony of physicians is valuable.

The International Medical Congress, held at London in 1881, attended by three thousand physicians, resolved unanimously "that experiments on animals are indispensable to the future progress of medicine." Before the British Medical Congress, in 1881, Professor Humphry declared that "almost every advance in our knowledge of the working of the human body has been made through vivisection."

In the United States, resolutions affirming the value of experiments upon animals, and deprecating legislative

interference, were adopted by seven medical schools, by the New York Medical Society, and by sixteen organizations in various localities.

Three of the leading American universities have been quoted in support of the practice, and to the number is to be added Harvard Medical School, a believer in the experimental method.

But, after all, there are a number of experiments, a small number, which necessarily involve pain to animals, and in their defence it is only necessary to fall back upon the original position that the pain is justifiable for the sake of the good that is accomplished. These are the ones necessary to demonstrate the effects of drugs, of poisons like that of cholera, and such as were performed by Chossat, in which the animal must be deprived of food; but the experiments which cause pain become fewer and fewer as physiology advances, until all that remains to be studied is pain itself, and the physiologist can study that best upon his own body.

Some hasty opponent has recommended vivisectors to practise among themselves. And so they have. The names of Toynbee, found dead in his laboratory, Christison, Hunter, Heinrich, Dvorak, Schiff, need but be mentioned in this connection.

It is not a pleasant occupation spending one's days and nights in nauseous dissecting rooms, surrounded by dead and dying animals. Physiologists have found themselves ostracized and vilified, and their practice ruined for it when they had any, but the misrepresentation which they have suffered has not stayed their hand from working for science and humanity. Like the good Samaritan of the parable, they subjugate feeling to judgment, and do not pass by on the other side with pity or scorn.

The provision that vivisection should not be practised unless there is a probability of beneficent results must not be pushed too closely, for science must be untrammelled. The science of to-day brings us nearer to the science of the future, and one truth may in an unseen way be the germ of others. Science has only to do with the seeking of truth; utility will follow in its train. Who, for instance, could foresee that a simple physiological preparation, the leg of a frog, with its living but non-sentient nerve, in the hands of Galvani, was to be the origin of galvanism, electricity, and allied subjects.

If one urge that experiments may be performed on one class of animals and not on another, it is to be said in reply that no two persons could agree where to draw the line between the bacillus and the dog, and some might even include within the pale the phylloxera that formerly destroyed the vineyards of a nation.

For the benefit of those who deny that utility and morality have any interdependence, it will be necessary to refer to the ethics of vivisection. If there is a moral

wrong involved in experimenting on animals, then, they say, no considerations of utility can justify it, even if by the death of one animal the light would break upon the pestilence that stalketh only in the darkness, and that there may be a knowledge which man is bound to forego, that the alleviation of human pain is not the highest good. According to the same principle it were better to starve than to do that violence to the moral nature which is involved in the death of a creature. They say that honor should deter man from exercising the tyrant's power which nature has given him, and that it is well-nigh impossible to deal rightly with animals when men are at the same time judge, accuser, witness, and culprit.

Another class of objectors resist scientific research because it loves what art hates—analysis, and yet another class because they accuse it of attempting to reduce God to a "physical necessity." To the one it may be said that art itself must have a basis in truth, and "to the solid ground of nature trusts the mind which builds for aye," and the other class of objectors is urged to remember that the "kingdom of God is within."

But the greatest show of reason is with those who object on what they call "moral grounds." Arguments have been urged against them by Virchow, who held that an animal was a man's "honestly bought chattel," and by Dr. Carpenter, who affirmed that "moral duties exist only towards those possessing moral responsibility," but these do not meet the case. As reasoning beings we can only be reasonable when we deal with the facts around us as we find them. It would be easy to conjure up Swift's land of the "houyhnhnms," where the relations between men and beasts were reversed, but with this condition we have not to do; there is no brotherhood between man and beasts. Without insisting too strongly on the fiat which went forth in the world's first springtime, "Let man have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth," it is undeniably one of the principles of creation that animals are subordinate to man for his use in the progress of life. Nature has ordained it, and Nature is not without pain to living beings whilst they dwell in this world, or whilst they come into or leave it. "The whole creation groaneth and travaileth in pain." Man has to live; like the Apostle he is enjoined to "Rise, kill, and eat." Man's duties towards inferior creatures must take in man's nature, which he cannot discard. Therefore his relations towards animals can only in a qualified sense be regarded as ethical, and the divine injunction cannot apply: "Do unto others even as ye would that they should do unto you." It would involve one in a tiresome discussion to include a consideration of sacrifice, vicarious and by compulsion; but it might be noted that the Great Teacher admitted that mankind was of more value than many sparrows.

If vivisection is productive of good to humanity, it remains to be considered under what restriction it should be practised. Vivisection and cruelty are in no way bound up together, and even if in some countries it appears that improper methods are used, it does not follow that the practice should everywhere be restricted. Because exiles are badly treated in Russia, it does not follow that no criminals should be sent to Siberia, or that lawbreakers should go unpunished. The only country where restrictive legislation is in force is England, though the attempt was made in Germany, Sweden, Denmark, and the United States. The first attempt was made in 1875, by Lord Hartismere's bill, but it never came into force. Then a Royal Commission was appointed, composed of Lord Cardwell, Lord Winmarleigh, Hon. W. E. Forster, Sir John Karslake, Professor Huxley, Mr. Erichsen, and Mr. Hutton, to inquire into the "practice of subjecting live animals to experiment for scientific purposes." They examined every person in England likely to throw any light on the question. The evidence is contained in a bulky blue-book, and in that report it is stated: "The imputation of cruelty, which has always been indignantly repudiated, has not been substantiated by a single authentic instance. In their evidence given before the Royal Commission, the Society for the Prevention of Cruelty to Animals state, through their secretary, that "they do not know a single case of wanton cruelty." The report also recommended "that no ban be placed upon vivisection."

The Belgian Special Commission's report, published last July, practically substantiates this position. In addition, nearly all the physiologists in Great Britain sent a memorial to the House of Commons deprecating any legislative interference. Notwithstanding the failure of a Royal Commission to obtain evidence of the abuse of physiological vivisection in Great Britain, the legislature was induced to pass a prohibitory enactment, which has been so worked as almost to prevent experimental research on live animals in England ever since.

Lord Carnarvon's bill prescribed:—

1. That experiments must be performed with a view only to the advancement by new discovery of knowledge which will be useful for saving or prolonging human life or alleviating human suffering.
2. That they must be performed in a registered place.
3. By a person holding a license.
4. The animal must, during the whole experiment, be under the complete influence of some anæsthetic.
5. It must be killed before it recovers consciousness.
6. Experiments must not be performed for demonstration.
7. They may be performed for the purpose of acquiring manual skill.

In 1883 Mr. Reid introduced another bill, but it never came to a discussion.

The effect of this mischievous and meddling legislation was disastrous to English physiology, and compelled those who practised vivisection to flee to France and Germany, and to draw upon the United States for their medical knowledge. Mr. Lister found the working of the Act "so vexatious as to be practically prohibitory," and went to Toulouse to carry on his investigations. Dr. Greenfield, pathologist, of Edinburgh University, regarded it as "almost hopeless to attempt any useful work in this country," and cites cases where patients died in consequence. Professor Fraser experienced the "mortification of being refused a license to investigate the poison used by natives of Borneo for their arrows." Professor Foster considered the "legislative action has crippled physiological research in England. We are asked to make bricks when they have taken away the straw." Sir James Paget thought it intolerable that he might pay a rat-catcher to poison the animals about his place, and not be permitted to use them for the good of mankind, or that he should have to appeal to a government official for leave to prick a mouse. Speaking of the Congress of 1881, in which Virchow declared the charge of cruelty was a subterfuge, Professor Foster said: "One good fruit of the present Congress is that our foreign brethren, seeing our straits, will go home determined to resist to the utmost all attempts to put the physiological inquirer into chains." Dr. Lauder Brunton was engaged in England in experimenting with the poison of venomous serpents, when restrictive legislation was introduced and put an end to them. But the government that introduced the legislation supplied Dr. Weir Mitchell and Dr. Reichert, who lived in a more reasonable country, with the snakes, and they succeeded in isolating the poison. This was necessary before discovering an antidote to a poison which annually carries off 20,000 victims. Mr. Horsley, in the *British Medical Journal*, protests against the difficulty of obtaining a license, and Dr. Wyatt Johnston observed that the incubation period of disease should be lengthened, since it usually developed before a license could be procured. Scientific men are averse to be licensed like publicans or prostitutes. They refuse to work in an atmosphere of distrust and suspicion, even upon subjects not prescribed by law, and object to having their laboratories searched by detectives as if they were smugglers' dens. Notwithstanding the existence of a law which limited the number of persons performing experiments to twenty-six in England, Scotland, and Ireland, and under which the government inspectors continually spoke of the cruelty practised as "insignificant," "inappreciable," "equal to that caused by vaccination," the opponents of vivisection were not satisfied, and in 1883 used every endeavor to have the practice totally prohibited. This legislation, so sweeping in its provisions and so drastic in its results, one would think left to the votaries of the sup-

pression of vivisection very little to desire. One of the foremost of them, Mr. Colam, acknowledged that after employing the "surveillance of detectives," he could "not accuse the physiologists of cruelty." But after all, Frances Power Cobbe, the chief scribe of the anti-vivisectionists, was led to exclaim that "*anti-vivisectionists recognized that their work must take the shape of an ethical and religious agitation.*" The law hampered and harassed the vivisectionists for a time, till they were able to take up their work in other countries, but the total amount of pain inflicted was not diminished by one iota. Fortunately for humanity, there were centres where researches could still be carried out, but the results have not gone to further the credit of English physiological work, being arrived at under the ægis of foreign schools. The public is exacting of the ability of a physician, but by a senseless agitation it forbade the means of acquiring knowledge. Yet it has not been slow to avail itself of the advantages derived from physiological research, and would stand aghast if medical men were to cast aside what has been gained by the method of vivisection, and return to the days when quacks flourished and vended their vaunted nostrums, their charms and cure-alls. But the indications are that English physiologists will not long remain under the burden, and it is fairly certain that a similar restriction will never again be placed upon scientific men. The medical journals are no longer shy of the practice, and adopt no line of excuse, but treat the objections with aggressive scorn, confident that they are based upon assumption and illogical reasoning.

In the United States there is really no restriction placed upon vivisection and the discussion of the question has been meagre. Professor Dalton makes the general statement: "The exhibition of pain in an experimental laboratory is an exceptional occurrence. As a rule all the cutting operations are performed under the influence of ether" (not of curare, which dulls the motor but not the sensory nerves).

Dr. Leffingwell, by quotations from the physiological treatises of Professors Dalton and Flint, shows that there are only seven cases in which anæsthetics are not always employed, and in them there is reason to believe the pain inflicted is either brief or not very severe, and that there is also reason for belief that there is an annual decrease in the number of such demonstrations! The charge of Ray Lankester is thus disproved, "that the number of experiments must increase in geometric ratio as physiology advances."

Prof. H. C. Wood writes: "So far as concerns the medical schools of Philadelphia, vivisection without anæsthetics is not practised to any extent, if at all, for class demonstrations."

In 1867 an Act was passed by the State of New York "for the more effectual prevention of cruelty to animals." It declared it a misdemeanor to "unnecessarily or needlessly mutilate or kill any living creature," but nothing in the Act

was to be construed "to prohibit or interfere with any properly conducted scientific experiments or investigations performed only under the authority of some regularly incorporated medical college or university of the State of New York." This law was so vague, its provisions did not interfere with vivisection any more than the Blue Laws prevent reasonable recreation on Sunday.

At the session of 1881, Mr. Henry Bergh introduced into the New York Legislature a bill providing "that every person who shall perform or cause to be performed or assist in performing upon any living animal an act of vivisection shall be guilty of a misdemeanor," and "the term vivisection used in this Act shall include every investigation, experiment, or demonstration producing pain or disease in any living animal, including the cutting, wounding, or poisoning thereof." The attempt was renewed in 1882, and again in 1883, but since that time nothing has been heard of the bill, and vivisection in America is practically untrammelled, a fact the English Government has not been slow to take advantage of to evade the provisions of its own laws. From this it appears that vivisection can be practised in a civilized country extensively and carefully, without cruelty or unreasonable pain and without legislative interference. Indeed, the physiologists and legislators of the United States have proved the case for unrestricted vivisection. As the celebrated Owen said, "The Legislature of the United States of America, assailed by well-meaning ignorance, has refused to pass a law which would cast an unproven and unmerited stigma on scientific men."

If anti-vivisectionists claim that legislation has not diminished the practice as a whole, then their labor has been in vain; if they claim that it has, then they have committed a wrong against humanity, in the light of the benefits vivisection has bestowed. But it is impossible to apply these principles by any other than moral force, and the great work the opponents of vivisection have wrought is that they have stimulated and rendered sensitive the moral sense of operators, which deters them from unnecessary cruelty.

Dr. Pye-Smith, in his address before the British Association in 1879, laid down the lines on which anti-vivisectional legislation is at all permissible. "The only restriction which Christian morality imposes upon such practices is that no more pain shall be inflicted than is necessary for the object in view. Any one who would inflict a single pang beyond what is necessary for a scientific object, or would by carelessness fail to take due care of the animals he has to deal with, would be justly liable to public reprobation. This means that the physiological laboratories should be licensed like dissecting rooms under the Anatomy Act in England; and licenses given only to persons of adequate knowledge and known character, and that then the experts should be left to follow their own methods."

Upon the question of the restriction of vivisection, Professor Dalton says categorically: "I think investigators and teachers should be the sole judges as to what is necessary in their investigations and teachings." Dr. L. S. Pilcher believes it only necessary that "the public should be informed of the truth relating to vivisection in order that there should be secured to science every advantage and privilege which its advancement may need." Professor Wesley Mills, the leading physiologist in Canada, declares openly that a scientist can be the only judge of the rights and obligations of his own profession. Dr. Osler, his predecessor, now of Johns Hopkins, was of a similar mind. In Dr. Yeo's table it is admitted that only one experiment in a hundred is painful. Legislation aims to deal with this one case, and in doing so suppresses the other ninety-nine as well, and the way to ensure that not more than one case in a hundred shall be painful and yet science go untrammelled, is not by legislative enactments based on sentiment and insufficient knowledge, but, as Frances Power Cobbe, its most ardent opponent, admits, "by an ethical and moral agitation," by a more refined morality on the part of the operators and the community in which they live, brought about by the methods of ethics and religion. The action of the societies for the prevention of cruelty to animals, by countenancing the enthusiasts who would suppress vivisection, has alienated the support of physicians whose position and relations would be invaluable in furthering the general aims of the societies.

It does not appear either that restrictive legislation has lessened the sum total of cruelty, or that physiologists have altered their methods under its compulsion. It will always be ineffective, because there will continue to be communities not overpowered with "genuine British narrowness," where biologists can labor unimpeded in the cause of truth, science, and humanity.

The extent to which legislators should interfere with vivisection is very limited, unless they choose to incur the responsibility Darwin speaks of, that "he who retards the progress of physiology commits a crime against mankind." Physiologists assent themselves to the principles laid down by Sir Thomas Watson: that experiments must not be performed at random to see what will happen; that they must have some object in view, a question to settle or a doubt to remove, and with a reasonable hope of resulting benefit; that operators have the skill, judgment, and intelligence and previous knowledge to make experiments successful and instructive; that they guard against everything that would enhance pain and do nothing out of mere curiosity.

Looking at the whole question from the distance of a few years, and in the light of the results that have been attained since then, it is clear that the outcry against vivisection has

been the result of a popular delusion that cruelty and vivisection were synonymous, that the experiments were useless and unnecessary, and that the same knowledge might have been gained in some other way.

But the present exposition of facts shows that vivisection is not of necessity cruel, and that—

1. It has tended to correct and extend our knowledge of the functions of the human body.
2. It has aided in obtaining exact knowledge of the processes of disease.
3. It has tested the remedies by which diseases are to be controlled.
4. By it the means have been ascertained of checking contagion and preventing epidemics both in man and beasts.
5. Poison can be detected.
6. All this information could have been obtained in no other way.
7. There is no moral wrong involved in the operations either to animals, to operators, or spectators.

While physiologists and physicians know it as a fact that the road to a more perfect medical science lies through experiment, it may be painful experiment, they can afford to resist the clamor of those whom they would serve, believing, by the added experience of two centuries, with Harvey of immortal name, who in speaking of this same subject declared that skill and knowledge could be arrived at "*non ex libris sed ex dissectionibus.*"

"Dear friends, kind women, sweet with all of innocence and truth,
Bright, laughing maidens, flitting by in happiness and youth,
Gay children, *grave and bearded men*, we pray you all give ear;
Dear friends, kind friends, we turn to you for sympathy and cheer.
Uphold us in our noble work, nor let us speak in vain
For those too helpless to protest, too patient to complain;
Be pitiful, be generous to help us in our need,
And He who notes the sparrow's fall shall surely bless the deed."

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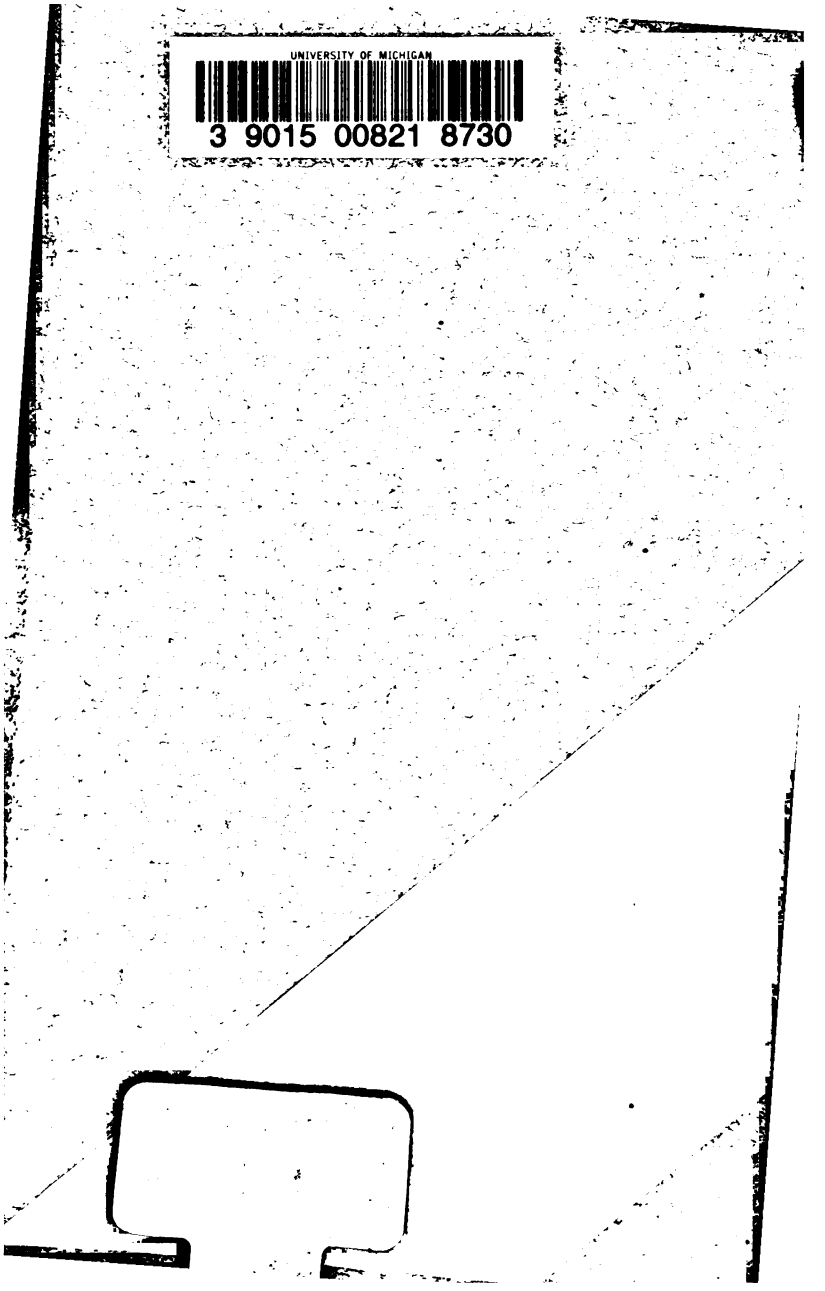
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